Network Screening "Into the Darkness"



Safety Assessment Methods

- FHWA-SA-16-016: Guide Developed by TPF-5(255) HSM Implementation Pooled Fund Study
- Observed vs Predicted Methods
- What other states are doing and methods they are using
- PA's Network Screening Method





FHWA Safety Program

U.S. Department of Transportation Federal Highway Administration Safe Roads for a Safer Future Investment in readway safety saves lives http://scifety.flwcd.dof.gov



Using Observed Crashes for Analysis

- Can be very relevant & useful in evaluating the recent safety performance on existing facilities
- Becomes less relevant in estimating the future safety performance of existing facilities
 - When traffic conditions change significantly
 - When projects make substantial design changes to those facilities.
- May be of limited or no relevance for project alternatives that substantially change the type of the roadway or for facilities on brand new locations.
- There is a need, therefore, to select the appropriate safety assessment method or methods for the unique project development task.



Safety Assessment Methods (Observed Data)

Limits of Using Only Observed Crash Data



Safety Assessment Methods

So what about crash rates?

Crash Rate is the Most Common Measure of Safety



The Colorado & Montana Example





The Colorado & Montana Example

- **Before Gambling:** Average Rate = 2.26
- After Gambling: Average Rate = 1.23
- Highway Alignment and Typical Cross-Section have not Changed
- After the Introduction of Gambling, the % of Crashes Involving Alcohol increased 500%.



The Colorado & Montana Example

Is Drinking and Driving Plus Gambling Good for Highway Safety?







Data Driven Safety Analysis

How can we improve safety assessments?

Use the Highway Safety Manual



Network Screening using the HSM

- <u>Safety Network Screening</u> is reviewing a transportation network to identify sites based on the potential for reducing average crash frequency
- A summary of Safety Network screening options are in Chapter 4 of the AASHTO's 2010 Highway Safety Manual
- Table 4-1 shows the Data and Input needs for each specific Performance Measure
- Pennsylvania uses the Excess method w/ EB adjustments



		Data Re					
	Performance Measure	Road Type /	Traffic	Observed	Other Inputs		
		Characteristic	Volume	Crash			
_	_ Average Crash Frequency	\checkmark		√			
	Crash Rate	\checkmark	✓	\checkmark			
HSM2 Removing	Equivalent Property Damage Only (EPDO) Average Crash Frequency	\checkmark		√	EPDO Weighting Factors		
	Relative Severity Index	\checkmark		\checkmark	Relative Severity Indices		
	Critical Rate	\checkmark	√	\checkmark			
	Excess Predicted Average Crash Frequency Using Method of Moments	\checkmark	\checkmark	\checkmark			
	Level of Service of Safety	\checkmark	\checkmark	\checkmark	Calibrated SPF with Overdispersion Parameter		
	Excess Predicted Average Crash Frequency Using SPFs	\checkmark	✓	\checkmark	Calibrated SPF		
	Probability of Specific Crash Types Exceeding Threshold Proportion	\checkmark		\checkmark			
	Excess Proportion of Specific Crash Types	\checkmark		\checkmark			
	Expected Average Crash Frequency with EB Adjustment	\checkmark	✓	\checkmark	Calibrated SPF with Overdispersion Parameter		
	EPDO Average Crash Frequency with EB Adjustment	\checkmark	~	\checkmark	Calibrated SPF with Overdispersion Parameter & EPDO Weighting Factors		
PA Uses —	Excess Expected Average Crash Frequency with EB Adjustment	\checkmark	~	\checkmark	Calibrated SPF with Overdispersion Parameter		

HSM - Potential For Safety (Excess method w/ EB adjustment)





Safety Analyst Tools



- Ohio
- Kansas
- Michigan
- Washington
- Illinois
- Kentucky



Safety Analyst™

- Montana
- West Virginia
- Israel



How To Logically Group and Compare Facilities?

SPF Equations Developed by Penn State

- Intersections
 - Two-Lane Rural
 - 5 SPF Equations based on traffic control
 - Multilane Rural
 - 3 SPF Equations based on traffic control
 - Urban Arterial
 - 9 SPF Equations based on District

- Segments
 - Two-Lane Rural
 - 11 SPF Equations based on District
 - Multilane Rural
 - 1 SPF Equation
 - Two-Lane Urban / Suburban
 - 11 SPF Equations based on District
 - Four-Lane Undivided Urban / Suburban
 - 1 SPF Equation
 - Four-Lane Divided Urban / Suburban
 - 1 SPF Equation



Pennsylvania's Highway Network Screening

Screening Categories

- Intersections
 - Urban
 - Rural



- Segments
 - Urban
 - Rural



- 1. This is similar to Ohio's Network Screening categories which use Safety Analyst (only uses SPFs with AADT & no adjustments)
- 2. Broken down by County



Network Screening Pilot

- Analyzed Cumberland and Erie Counties
- Utilized CDART to include:
 - Segments with crash clusters of at least 8 crashes within 1000 ft
 - Intersections with 10 or more crashes
- Utilized VideoLog and Google Maps for most site specific information
- Utilized PennDOT curve database for curve related information
- Included all dependent variable and documented all data in Excel
- Did not complete SPF calculations



Network Screening Spreadsheet Development

- Originally envisioned utilizing PennDOT HSM Analysis Tool A to complete SPF calculations
- Developed Excel spreadsheet to enter network screening information and complete SPF / excess value calculations
 - Separate spreadsheets for intersections and segments
 - Separate tabs for rural and urban facilities
 - Separate spreadsheets for each County
 - Accounted for varying inputs based on facility type
 - Easily editable
 - Allows for additional facilities



Network Screening – Segments

- Exclusive to State owned highways
- SPF calculations are based on AADT and dependent variables
- Utilized CDART and excluded intersection crashes
- Crash cluster thresholds varied by County from 3 and 12 crashes per 1,000 feet in order to get an average of 120 locations per County
- Those locations are split between the rural & urban tabs
- Some counties due to demographics may not have rural or urban lists or very short lists



Network Screening – Segment Challenges

- Eliminated locations that did not fit a SPF equation
- Extended segments to eliminate partial curves
- Reconciled primary / secondary segments
- Split segments up based on critical parameters
- Additional crash data was required based on the above modifications



Network Screening – Segments

				Beginning Ending		ding	Number of	rof												Observed				Europeted		
District	Country	BasedName	eD.					Lanes (Multi-	Langth (East)	AADT	Roadside	Bassing Zona	Shoulder	Total Dwys &	Number of	Total Degree of	Presence of	Canad Limit	Centerline	Observed	Coschood	Creakeed	Ourdingersian	0	Crasheed	Ennen
District		Road Name	ън	Segment	Offset	Segment	Offset	lane = 4 or more	Length (Feet)	AADT	Hazard Rating	Passing Zone	Rumble Strips	Intersections	Curves	Curvature	Median Barrier	Speed Limit	Rumble Strips	Crashes	Crashes r	Crasnes r	Overaispersion	w	Crashes r	Excess
						-		lanes)													Year	Year			Year	
8	Vork	Springwood Bd	2002	0300	1996	0070	2227	2.120.0	2359	16975	8	No	No	3	2	115	NVA	NVA	NVA	46	9.20	4.76	0.529	0.15	852	3.77
8	York	Carlisle Bd	0074	0750	2519	0760	2950	2-Jane	4348	21047	5	No	No	40	0	0	NVA	NVA	NVA	52	10.40	5.99	0.529	0.21	947	3.48
	Vork	Califiste Fig	0216	0730	2010	0240	2000	2 lana	1002	2001	e e	No	No	+0	1	72	NIG	NUO NUO	NUO NUO	20	5.00	0.00	0.525	0.21	4.07	3.40
- °	Veak	Base Ch	0216	0240	0340	0240	2022	2-lane	002	7054	°	No	No			12 E4	NIA	NIA NIA	NICA NUA	20	5.60 E.00	0.01	0.525	0.32	4.07	3.20
	TOR	Fennist	2031	0030	2013	0040	0420	2-lane	023	7204	4	NO	NO	4	2	04	N/A	INFA FOLIDIT	N/A	20	5.00	1.97	0.023	0.17	4.40	2.33
8	YORK	Blue-Gray Hwy	0015	0140	1610	0150	1082	IVIUITI-Iane	10/1	35897	4	N/A	NO	3	U	0	res	50 MPH	No	25	5.00	1.60	0.790	0.14	4.52	2.92
8	York	Mount Ulivet Rd	2095	0040	0801	0050	0941	2-lane	1491	2919	6	No	No	2	2	46	N/A	N/A	N/A	29	5.80	0.72	0.529	0.43	3.62	2.90
8	York	Windsor Rd	2031	0010	2313	0020	2222	2-lane	2382	4503	6	No	No	7	3	128	N/A	N/A	N/A	29	5.80	2.06	0.529	0.29	4.72	2.66
8	York	Camp Betty Washington Rd	2005	0040	1386	0050	0633	2-lane	2980	7836	6	No	No	10	2	257	N/A	NłA	NłA	40	8.00	4.89	0.529	0.18	7.44	2.55
8	York	Moulstown Rd	3072	0040	1902	0050	1318	2-lane	1454	8275	5	No	Yes	3	2	132	N/A	NłA	NłA	29	5.80	2.85	0.529	0.15	5.36	2.51
8	York	Lincoln Hwy	0030	0150	1061	0150	2917	2-lane	1856	14289	4	No	No	8	0	0	N/A	NłA	NłA	23	4.60	1.71	0.529	0.28	3.79	2.08
8	York	Carlisle Rd	0074	0730	2238	0750	0682	2-lane	1925	21735	5	No	No	14	0	0	N/A	NłA	NłA	24	4.80	2.58	0.529	0.21	4.33	1.75
8	York	Blue-Gray Hwy	0015	0160	2413	0160	3958	Multi-lane	1545	35897	4	N/A	Yes	0	0	0	Yes	55 MPH	No	17	3.40	1.07	0.790	0.26	2.79	1.72
8	York	Bryansville Rd	0851	0660	2227	0670	0257	2-lane	1227	1379	7	No	No	3	3	176	N/A	N/A	N/A	18	3.60	1.44	0.529	0.23	3.10	1.66
8	York	Country Club Rd	3054	0040	1350	0050	1338	2-lane	1842	19880	4	No	No	13	1	14	N/A	N/A	N/A	24	4.80	2.75	0.529	0.19	4.41	1.66
8	York	Sherman St Et	0024	0560	1888	0570	1801	2-lane	2383	6153	4	No	No	10	5	147	N/A	N∕A	N∕A	27	5.40	3,36	0.529	0.20	4.99	1.63
8	York	Moulstown Bd	3072	0030	0739	0030	1144	2-lane	405	8275	4	No	Yes	4	1	27	N/A	N/A	N∕A	14	2.80	0.92	0.529	0.14	2.54	1.62
8	York	Lincoln Hwu	0030	0010	0025	0010	1775	2-lane	1750	15663	4	No	No	12	0	0	N/A	NVA	NKA	20	4.00	184	0.529	0.25	3.46	162
8	York	Springwood Bd	2002	0080	0473	0080	1960	2-lane	1487	5247	â	No	No	6	3	62	N/A	NVA	NVA	18	3.60	149	0.529	0.26	3.05	156
8	York	Both Church Bd	3059	0040	0270	0050	0018	2-Jane	1314	1736	Å	No	No	1	3	106	NVA	NVA	NVA	16	3.20	0.87	0.529	0.35	2 38	151
	Vork	Erensuille Bd	2001	0020	1639	0030	1944	2-Jane	2229	5099	5	No	No	10	3	14.2	NUA	NVA	NVA	22	4.40	247	0.529	0.25	2.00	145
	Vork	Old Hapover Pd	2001	0020	2424	0100	0925	2-lane	1202	5405		No	No	6	1	62	NUA	NICO NILO	NICO NICO	15	2.00	117	0.525	0.20	2.49	122
	Vork	Cluster Pd	0074	0570	0672	0500	0323	2 lana	200	15927	7	No	No	20		60	NIG	NICO NUO	NICO NUC	21	6.00	4.69	0.525	0.20	E 94	1.02
	Veak	Sigueen Sc	4020	0070	0073	0000	10273	2-lane	2002	0327	4	NO No	No	30		00	NIA	NIA NIA	NIA NIA		0.20	4.00	0.525	0.17	177	1.20
	TOR	Nauvoo Hu	4023	0020	0063	0020	1323	Z-lane	1200	3366	0	NO No	NO No	<u> </u>		32	N/A	N/A N/A	NRA NIA	10	2.60	0.63	0.523	0.42	0.51	1.14
8	TORK	Consitution Ave	3007	0010	0028	0020	0093	Z-lane	1139	6480	0	NO	NO	8	4	55	INFA	N/A	INFA	14	2.80	1.46	0.529	0.22	2.01	1.05
8	YORK	Tyler Hun Ha	3056	0020	1869	0020	2617	2-lane	/48	/8/4	4	NO	NO	1	1	16	INFA	N/A	NKA	11	2.20	0.82	0.529	0.25	1.86	1.04
8	York	George St	0181	0120	1/16	0130	0521	2-lane	986	12808	5	No	No	8	U	0	N/A	N/A	N/A	11	2.20	0.95	0.529	0.27	1.86	0.91
8	York	Rosstown Rd	0177	0020	0785	0030	0499	2-lane	986	3498	6	No	No	2	1	30	N/A	N/A	N/A	10	2.00	0.52	0.529	0.40	1.41	0.89
8	York	Canal Rd	0921	0090	0947	0090	1791	2-lane	844	9031	5	No	No	3	1	36	N/A	N/A	N/A	11	2.20	1.07	0.529	0.22	1.95	0.88
8	York	Biesecker Rd	3061	0130	0151	0130	1029	2-lane	878	950	4	No	No	3	2	122	N/A	N/A	N/A	10	2.00	0.75	0.529	0.30	1.63	0.88
8	York	S Queen St	0074	0560	1051	0570	0196	2-lane	1220	15927	4	No	No	8	1	17	N/A	NłA	NłA	14	2.80	1.73	0.529	0.20	2.59	0.86
8	York	Lincoln Hwy	0030	0160	2209	0170	0899	2-lane	1671	16305	4	No	No	15	0	0	NłA	NłA	NłA	15	3.00	1.91	0.529	0.24	2.74	0.83
8	York	Clearview Dr	3006	0020	0649	0020	1511	2-lane	862	1081	5	No	No	1	2	91	N/A	N/A	NłA	9	1.80	0.54	0.529	0.36	1.35	0.81
8	York	Susquehanna Tr	0295	0040	2199	0050	0780	2-lane	1321	788	5	No	No	11	2	53	N/A	NłA	NłA	11	2.20	0.35	0.529	0.57	1.15	0.80
8	York	Delta Rd	0074	0220	0035	0220	0929	2-lane	894	5200	5	No	No	2	1	22	N/A	N/A	NłA	9	1.80	0.60	0.529	0.35	1.38	0.78
8	York	Canal Rd	0921	0080	0618	0080	1514	2-lane	896	9031	5	No	No	10	1	13	N/A	NłA	NłA	10	2.00	1.01	0.529	0.24	1.76	0.75
8	York	Days Mill Rd	3042	0190	2142	0200	0743	2-lane	1055	3766	4	No	No	6	2	54	NłA	NłA	NłA	10	2.00	0.94	0.529	0.29	1.69	0.75
8	York	Windsor Rd	2031	0080	1500	0090	0015	2-lane	1360	8438	5	No	No	11	1	8	N/A	N/A	N/A	11	2.20	1.15	0.529	0.30	1.89	0.74
8	York	Voolen Mill Rd	0851	0430	1651	0440	0893	2-lane	1075	2156	5	No	No	3	1	35	N/A	N/A	N/A	9	1.80	0.41	0.529	0.48	1.13	0.72
8	York	York Rd	0116	0180	2608	0190	0047	2-lane	741	11449	5	No	No	2	0	0	N/A	N/A	NłA	8	1.60	0.56	0.529	0.32	1.27	0.71
8	York	Tyler Run Rd	3056	0010	0021	0010	1281	2-lane	1260	7874	5	No	No	6	2	62	N/A	N/A	N/A	13	2.60	1.72	0.529	0.21	2.42	0.70
8	York	Susquehanna Tr	0295	0020	0562	0020	1188	2-lane	626	12127	5	No	No	2	1	20	N/A	N/A	N/A	9	1.80	0.93	0.529	0.19	1.63	0.70
8	York	Mountain Rd	4040	0110	1292	0120	0008	2-lane	758	2479	5	No	No	6	2	35	N/A	N/A	N/A	8	1.60	0.58	0.529	0.32	1.27	0.69
8	York	Hanover Rd	0116	0320	2327	0330	1315	2-lane	1746	14880	4	No	No	16	0	0	N/A	N/A	N/A	14	2.80	1.88	0.529	0.25	2.57	0.69
8	York	Main St / Hanover Bd	0116	0262	0608	0270	0681	2-lane	682	15780	5	No	No	3	0	0	N/A	N∕A	N∕A	8	1.60	0.67	0.529	0.27	1.35	0.68
8	York	Seven Valleus Bd	0616	0260	1692	0260	2477	2-lane	785	9817	5	No	No	6	0	i o	N/A	N/A	N/A	8	1.60	0.60	0.529	0.32	1.28	0.68
8	York	Canal Bd	4002	0080	2228	0090	0050	2-lane	906	2703	4	No	No	2	1	30	N/A	NVA	NVA	8	160	0.42	0.529	0.44	108	0.66
- ě	York	Hess Farm Bd	0214	0200	1355	0210	0930	2-lane	1584	3889	a	No	No	4	3	72	N/A	NKA	NVA	11	2.20	125	0.529	0.31	191	0.66
- ě	York	autz Creek Bd / Crapherry Valley	1014	0110	0055	0110	1035	2-Jane	980	769	a l	No	No	4	2	106	N/A	NVA	NVA	8	160	0.51	0.529	0.41	115	0.64
8	York	Old Hanouer Bd	3072	0070	1454	0070	1968	2-lane	514	4972	4	No	No	2	2	52	NUA	NVA	NVA	10	2.00	127	0.529	0.13	191	0.04
	Vork	Lombard Rd	2007	0040	0907	0050	0254	2-lane	14.00	10921	4	No	No	6		20	NUA	NUO	NUO	12	2.00	156	0.523	0.15	2 19	0.04
- °	Vork	Eombard For	0224	0040	0307	0000	1220	2-1ane 2 Jano	920	EE02		No	No		1	20	NIA	NIA NUA	NIA NIA	0	2.90	0.00	0.023	0.20	120	0.03
	Yest	Char View Dd	1010	0040	0300	0040	1230	2-tane	1201	2240	5	No	No			20	NIA	NIA NIA	NIA NIA	÷ -	1.60	0.63	0.023	0.33	1.30	0.61
8	TORK	Star View Ho	1010	0030	0304	0030	1909	2-lane	1201	2/95	0	NO No	INO No		4	28	N/A	N/A N/A	N/A N/A	×	1.60	0.61	0.528	0.91		0.58
8	YORK	Baltimore PK	0094	0070	0034	0070	0874	Z-lane	840	14415	4	NO No	INO No		U		N/A	N/A	N/A	8	1.60	0.86	0.529	0.26	1.41	0.55
8	York	Lirantley Hd	4001	0010	1/4/	0014	1005	2-lane	12/0	6337	5	No	No		2	62	N/A	NYA	NIA	10	2.00	1.30	0.529	0.26	1.82	0.52
8	YORK	YORK Hd	4035	0024	1842	0030	2080	Z-lane	2481	2773	6	No	NO		2	122	N/A	N/A	NKA	11	2.20	1.33	0.529	0.40	1.85	0.52
8	York	Iviain St / Pleasant Valley Rd	0616	0010	1300	0020	0830	2-lane	1533	1960	6	No	No	2	4	224	N/A	NYA	NYA	15	3.00	2.37	0.529	0.19	2.88	0.51
8	York	Canal Rd	0921	0040	3061	0050	0500	2-lane	1170	9037	4	No	No	3	1	27	N/A	I N/A	I N/A	9	1.80	1.10	0.529	0.28	1.60	0.50



Network Screening - Intersections

- Included at least one State highway
- SPF calculations are based on AADT and dependent variables
- Utilized CDART
- Crash clusters varied by County from 3 to 13 crashes per intersection in order to get an average of 160 locations per County
- Those locations are split between the rural & urban tabs
- Some counties due to demographics may not have rural or urban intersection lists or very short lists



Network Screening – Intersection Challenges

- Eliminated locations that did not fit a SPF equation
- Needed to collect Local Road AADT for most local roads
 - 2,261 local highway counts were necessary
 - Letter from HSTOD were sent to 694 municipalities
 - Each PennDOT District was provided a list of intersections
 - Numerous emails and phone calls were received from municipalities regarding the counts
- Intersection crashes account for all crashes within a 250 foot radius. Tight intersection spacing required further analysis.



Network Screening - Intersections

	1			Major Road						Minor Road										a .	D 1							
District	County	Municipality	Intersection Type	Road Name	Designation	Segment	Offset		umber of Lanes	Speed Limit	Left F	Right Turn C	Crosswalk	Road Name	Designation	Segment	Offset		òpeed Limit	Crosswalk	Skew	Observed Crashes	Observed Crashes / Year	Predicted Crashes / Year	Overdispersion	v	Expected Crashes / Year	Excess
8	York	West Manchester Twn	4-Lea Minor-Street Ston-Controlled	Bappister St	SB 3048	0030	1613	6440	2-lane	N/A	Lane L N/A	.ane	NZA	Adams St	T-518	NVA	NZA	3874	NVA	NZA	90	40	8.00	172	1348	0.30	6.12	4 40
8	Vork	Jackson Twp	4-Leg Minor Street Stop-Controlled	East Barlin Bd	SP 0234	0140	0000	5013	2-lane	NVA	NZA	NVA	NZA	Biosooker Pd	SP 3061	0130	0000	2179	NUA	NVA	75	29	5.80	143	1348	0.34	4.31	2.88
8	Vork	York Twp	3-Leg Minor-Street Stop-Controlled	Springwood Rd	SP 2002	0140	0644	5247	2-lane	NVA	No	No	NVA	Chapel Church Bd	T-736	NVA	NVA	5779	NZA	NVA	NVA	28	5.60	246	1 117	0.34	4.75	2.00
8	York	Windsor Twp	4-Leg Minor-Street Stop-Controlled	East Prospect Bd	SB 0124	0120	0000	5421	2-lane	N/A	N/A	N/A	N/A	Freusuille Bd	SB 2001	0040	0000	5088	N/A	N/A	80	20	4.00	182	1348	0.29	3.37	155
8	York	West Manchester Twn	4-Leg Signalized	Lipcolp Hwu	SB 0030	0200	0000	36317 N	Lulti-lana	N/A	N/A	NVA	N/A	Tripitu Bd/Baker Bd	SB 0616 / T-500	03307.004	2697/N/A	10463	NVA	N/A	NVA	43	8.60	5.82	0.203	0.20	7.32	150
8	York	York Twp	4-Leg Signalized	SQueenSt	SB 0074	0580	0000	15927 M	lulti-lane	N/A	N/A	N/A	N/A	St Charles Wy / Pauline Dr	LocalBd	N/A	N/A	8749	N/A	N/A	N/A	36	7.20	4 13	0.203	0.40	5.54	141
8	York	Codorus Twp	3-Lea Minor-Street Stop-Controlled	Steltz Bd	SR 0851	0030	0937	4259	2-lane	N/A	No	No	N/A	Fiscal Bd	T-360	N/A	N/A	222	N/A	N/A	N/A	18	3.60	0.69	1.117	0.56	1.97	128
8	York	Newberry Twp / Fairview Twp	3-Lea Minor-Street Stop-Controlled	Potts Hill Rd / Wundamere Rd	SR 0177	0180	0000	4798	2-lane	N/A	No	No	N/A	Potts Hill Rd	SR 0392	0010	0000	1267	N/A	N/A	N/A	17	3.40	1.36	1,117	0.40	2.58	1.22
8	York	Paradise Twp	4-Leg Minor-Street Stop-Controlled	Lincoln Hwy	SR 0030	0080	1230	13798	2-lane	N/A	N/A	N/A	N/A	Lake Rd	SR 3055 / T-388	0070/N/A	2717 / N/A	964	N/A	N/A	70	17	3.40	2.02	1.348	0.27	3.03	1.01
8	York	Windsor Twp	4-Leg Minor-Street Stop-Controlled	East Prospect Rd	SR 0124	0100	0933	5421	2-lane	N/A	N/A	N/A	N/A	Mountain Rd	T-766	N/A	N/A	1311	N/A	N/A	80	14	2.80	1.25	1.348	0.37	2.23	0.98
8	York	York Twp	4-Leg Signalized	S Queen St	SR 0074	0590	1018	20133 M	lulti-lane	N/A	N/A	N/A	N/A	Tyler Run Rd / Donna Ln	SR 3056 / Local Rd	00207N/A	2915 / N/A	7198	N/A	N/A	N/A	32	6.40	4.40	0.203	0.53	5.34	0.94
8	York	Heidelberg Twp	4-Leg Minor-Street Stop-Controlled	Old Hanover Rd	SR 3072	0080	0000	5485	2-lane	N/A	N/A	N/A	N/A	Iron Ridge Rd	SR 3047	0110	0000	1232	N/A	N/A	75	13	2.60	1.28	1.348	0.37	2.11	0.83
8	York	Windsor Twp	3-Leg Minor-Street Stop-Controlled	Penn St	SR 2031	0040	0000	7211	2-lane	N/A	No	No	N/A	Shaw Rd	T-758	N/A	N/A	18	N/A	N/A	N/A	16	3.20	0.36	1.117	0.71	1.18	0.82
8	York	Lower Windsor Twp	4-Leg Minor-Street Stop-Controlled	Main St / Mt Pisgah Rd	SR 2009	0130	0000	3955	2-lane	N/A	N/A	N/A	N/A	Yorkana Rd / Bluestone Rd	SR 2019	0030	0000	1793	N/A	N/A	60	13	2.60	1.33	1.348	0.36	2.14	0.81
8	York	Newberry Twp	4-Leg Minor-Street Stop-Controlled	Lewisberry Rd	SR 0382	0140	0000	6147	2-lane	N/A	N/A	N/A	N/A	York Rd / Old Quaker Rd	SR 4009 / T-917	02007N/A	3554 / N/A	1684	N/A	N/A	85	13	2.60	1.38	1.348	0.35	2.17	0.79
8	York	Jackson Twp	3-Leg Minor-Street Stop-Controlled	Old Hanover Rd	SR 3072	0130	3048	8103	2-lane	N/A	No	No	N/A	Lake Rd	SR 3092	0060	3725	2726	N/A	N/A	N/A	17	3.40	2.31	1.117	0.28	3.09	0.78
8	York	Paradise Twp	4-Leg Minor-Street Stop-Controlled	East Berlin Rd	SR 0234	0020	1827	7720	2-lane	N/A	N/A	N/A	N/A	Canal Rd	SR 4002	0080	0907	2914	N/A	N/A	60	16	3.20	2.16	1.348	0.26	2.93	0.77
8	York	Heidelberg Twp	3-Leg Minor-Street Stop-Controlled	Old Hanover Rd	SR 3072	0100	0000	5485	2-lane	N/A	No	No	N/A	Menges Mill Rd	T-376	N/A	N/A	2461	N/A	N/A	N/A	15	3.00	1.85	1.117	0.33	2.62	0.77
8	York	York Twp	4-Leg Minor-Street Stop-Controlled	Hollywood Dr	SR 3023	0020	0912	10983	2-lane	N/A	N/A	N/A	N/A	Lancaster Ave / Mall Ent	Local Rd / Private Dw	y N/A	N/A	692	N/A	N/A	85	13	2.60	1.47	1.348	0.34	2.22	0.75
8	York	Dover Twp	4-Leg Signalized	Carlisle Rd	SR 0074	0760	1812 :	21047	2-lane	35 MPH	N/A	No	N/A	Fox Run Rd / Alta Vista Dr	T-818 / T-945	N/A	N/A	2862 2	5 MPH	N/A	N/A	19	3.80	2.66	0.579	0.39	3.36	0.70
8	York	Fairview Twp	4-Leg Minor-Street Stop-Controlled	Wyndamere Rd	SR 0177	0220	0000	4643	2-lane	N/A	N/A	N/A	N/A	Salem Rd	SR 1007 / T-684	0010 / N/A	0000 / N/A	4225	N/A	N/A	80	13	2.60	1.59	1.348	0.32	2.28	0.69
8	York	York Twp	4-Leg Signalized	Springwood Rd	SR 2002	0060	0866	16975	2-lane	35 MPH	N/A	No	N/A	Chestnut Hill Rd	T-714	N/A	N/A	4575 3	5 MPH	N/A	N/A	21	4.20	3.21	0.579	0.35	3.85	0.64
8	York	Jackson Twp	4-Leg Signalized	Lincoln Hwy	SR 0030	0150	2117	16801	2-lane	40 MPH	N/A	No	N/A	Biesecker Rd	SR 3061	0110	0000	2179 4	5 MPH	N/A	N/A	22	4.40	3.47	0.579	0.33	4.09	0.62
8	York	Dover Twp	3-Leg Signalized	Carlisle Rd	SR 0074	0760	2218 ;	21047	2-lane	35 MPH	N/A	N/A	Yes	Davidsburg Rd	SR 4008	0200	3111	8229	N/A	Yes	N/A	15	3.00	2.11	0.982	0.33	2.71	0.60
8	York	York Twp	4-Leg Minor-Street Stop-Controlled	Grantley Rd	SR 4001	0010	1229	6337	2-lane	N/A	N/A	N/A	N/A	Monument Rd	Local Rd	N/A	N/A	4140	N/A	N/A	70	14	2.80	2.00	1.348	0.27	2.58	0.58
8	York	Dover Twp / Conewago Twp	4-Leg All-Way Stop-Controlled	Canal Rd	SR 0921	0040	2561	9803	2-lane	40 MPH	N/A	N/A	N/A	Bull Rd	SR 4001	0230	0000	9015	N/A	N/A	N/A	23	4.60	3.94	1.283	0.17	4.49	0.55
8	York	Spring Garden Twp	4-Leg Signalized	Prospect St / Mt Rose Ave	SR 0124	0020	0000	13425	2-lane	35 MPH	N/A	No	N/A	Ogontz St	T-332	N/A	N/A	3871 2	5 MPH	N/A	N/A	17	3.40	2.49	0.579	0.41	3.03	0.54
8	York	York Twp	3-Leg Minor-Street Stop-Controlled	Powder Mill Rd	Local Rd	N/A	N/A	3740	2-lane	N/A	No	No	N/A	Tyler Run Rd	SR 3056	0010	0000	7198	N/A	N/A	N/A	15	3.00	2.27	1.117	0.28	2.80	0.53
8	York	Jackson Twp	4-Leg Minor-Street Stop-Controlled	Lincoln Hwy	SR 0030	0120	0000	14289	2-lane	N/A	N/A	N/A	N/A	Big Mount Rd / Labott Rd	SR 4051/ T-458	0010 / N/A	0000 / N/A	2761	N/A	N/A	60	18	3.60	2.95	1.348	0.20	3.47	0.52
8	York	Hopewell Twp	4-Leg All-Way Stop-Controlled	Plank Rd	SR 2074	0070	0000	5299	2-lane	45 MPH	N/A	N/A	N/A	Mt Olivet Rd / Bowman School Rd	SR 2095 / T-433	0010 / N/A	0000 / N/A	2919	N/A	N/A	N/A	17	3.40	2.78	1.283	0.22	3.26	0.48
8	York	Windsor Twp	3-Leg Minor-Street Stop-Controlled	Winterstown Rd	SR 0024	0250	0000	6198	2-lane	N/A	No	No	N/A	Duke St	SR 2083	0010	0000	2537	N/A	N/A	N/A	13	2.60	1.98	1.117	0.31	2.41	0.43
8	York	York Twp	4-Leg Signalized	S Queen St	SR 0074	0570	1543	15927	2-lane	35 MPH	N/A	No	N/A	Acco Dr	LocalRd	N/A	N/A	769 2	5 MPH	N/A	N/A	13	2.60	1.75	0.579	0.50	2.18	0.43
8	York	Dover Iwp	4-Leg Signalized	Uavidsburg Rd	SR 4008	0180	0000	5544	2-lane	40 MPH	N/A	No	N/A	Salem Church Rd	SR 4003	0090	0000	4193 4	имрн	N/A	N/A	17	3.40	2.69	0.579	0.39	3.12	0.43
8	York	Lower Chanceford Twp	3-Leg Minor-Street Stop-Controlled	Uelta Rd	SR0074	0130	0000	6160	2-lane	N/A	No	No	N/A	Holtwood Hd	SR0372	0010		3643	N/A	N/A	N/A	14	2.80	2.25	1.117	10.28	2.65	0.40
8	York	Uover Iwp	4-Leg Signalized	East Berlin Hd	SRU234	0170	0000	6657	2-lane	45 MPH	N/A	No	N/A N/A	Salem Uhurch Rd	SR 400371-528	00407N/A	00007N/A	5812 4		N/A	N/A	20	4.00	3.51	0.579	0.33	3.84	0.33
- 0	YORK	Newberry Iwp	4-Leg Signalized		DR 033271-68	00607107A	000071974	3255 N	Z-lane	40 MPH	NIA		NIA	P IN CLOUMUD	SR033271-322	1110 UNUA	1000071N/A	3036 3	SMPH	N/A	N/A	10	3.20	2.13	0.573	0.39	3.UZ	0.23
	YOR	Larroll Twp	4-Leg Signalized	Diue-Gray Hwy	00015 0000054	0120	0004 /	27043 M	iuiti-iane Maistane	N/A NIA	NIA		NIA	Daitimore Str Uid Milli Rd	<u> 38007471-071</u>		100471N/A	1021	N/A NIA	N/A	N/A	17	5.40	4.30	0.203	10.50	3.13	0.21
	Y OFK	Spring Garden Twp	4-Leg Minor-Street Stop-Controlled	Richland Ave	SR 3034	0024	2343	17440 1*	2 logo	N/A NIA	NIA		NIA	Nings Milli Ra	I -323	DICA NUA	N/A NIA	921	NIA	N/A	1N/A	10	3.40	3.00	1.301	0.40	3.24	0.10
-	Y ork	Viedaar Tue / Vark Tue	4-Leg Minor-Street Stop-Controlled	Capa Hara Dd	SD 0074	0420	0000 1	24603	2-lane	N/A N/A	Vea	Nice	N/A N/A	Allegheny Dri Private Dwy	SD 2021	0120	2921	9439	NIA	N/A N/A	NUO	22	2.00	4.96	1 117	0.23	4.30	0.13
- 0	York Vork		3-Leg Minor-Street Stop-Controlled	Cape norn Ro	SD 0024	0420	1345	24603	2-lane 2-lane	N/A N/A	Tes NUA	NUA	N/A N/A	Oskland Pd	T_821	NU0	2021 NUA	2564	NUA	NIA	1N/A	16	4.40	9.20	1348	0.17	3.18	0.12
	Ved	Sevine Cordee Two	4-Leg Minor-Street Stop-Controlled	Madaa Sa	SD 0462	0110	0000 1	21047 25067 M	z-iane Nubi-lana	NIA	NUA	NUA	NUA	Balmant St	90 2027 JL and Dd		07191808	10105	NUA	NUA	00 NUA	25	5.20	5.00	0.202	0.13	5.10	-0.01
-	Verk	Concernance Two	4-Leg Signalized	Casal DdJ Casal Dd Ewit	SD 0402	0120	0000 /	7539	2-lane		NUO	No	NUO	Sussuebases Tr		NUO	NUA	4522 4		NUA	NUO	15	3.00	3.02	0.203	10.30	3.01	-0.01
- 0	Vork	Vork Twp	3-Log Minor-Street Step-Controlled	Canal Not Canal No Exit	SP 2005	0040	0000	7836	2-lane 2-lane	NUA	No	No	NUA	Chostout Hill Pd	T-692	NUO	NUA	5951	NUA	NUA	NUA	15	3.00	3.02	1 117	10.30	3.00	-0.07
8	York	Carroll Twp	4-Leg Signalized	Blue-Grau Hwu	SB 0015	0110	0000	27043	z name Iulti-Japo	NZA	NZA	NVA	NZA	Harrisburg St / Mountain Pd	SB 4040	0150	0000	3596	NVA	NVA	NVA	22	4.40	4.50	0.203	10.23	4.45	-0.02
8	Vork	Carloin Twp	4-Leg Signalized 4-Leg All-May Stop-Controlled	Steltz Pd / Jefferson Pd	SP 0516	0070	0591	4954	2-lane	45 MDH	NVA	NVA	NVA	Blooming Group Pd / Sticks Pd	SP 0216	0230	0000	3978	NZA	NVA	NVA	13	2.60	2.70	1.283	0.32	2.62	-0.03
8	York	Dover Twp / Copewago Twp	4-Leg Minor-Street Stop-Controlled	BullBd	SB 4001	0210	0000	3015	2-lane	N/A	N/A	N/A	N/A	Hilton Ave	T-830	N/A	N/A	4357	N/A	N/A	50	13	2.60	2.81	1348	1021	2.64	-0.17
8	York	West Manchester Two	4-Leg Signalized	Lincoln Hwu	SB 0030	0280	1215	47138 N	lulti-lane	N/A	N/A	N/A	N/A	Kenneth Bd	T-722	N/A	N/A	8718	N/A	N/A	N/A	29	5.80	6.29	0.203	1044	6.02	-0.27
8	York	West Manchester Two	4-Leg Signalized	Carlise Ave / Carlisle Bd	SR 0074	0700	0000	21735 M	lulti-lane	N/A	N/A	N/A	N/A	Brougher Ln	T-811	N/A	N/A	5410	N/A	N/A	N/A	19	3.80	4.37	0.203	0.53	4.10	-0.27
8	York	York Twp	4-Leg Signalized	S Queen St	SB0074	0540	0000	16137	2-lane	35 MPH	N/A	Yes	N/A	Honey Valley Bd / Coventry Bd	LocalBd	N/A	N/A	2597 3	OMPH	N/A	N/A	13	2.60	3 18	0.579	10.35	2.80	-0.38
8	York	Dover Twp	4-Leg Signalized	Carlisle Rd	SR 0074	0750	2943	21047	2-lane	35 MPH	N/A	No	N/A	Emig Mill Bd / Private Dwu	T-809 / Private Dwu	N/A	N/A	5352 3	5 MPH	N/A	N/A	15	3.00	3.58	0.579	0.33	3.19	-0.39
8	York	Dover Twp	4-Leg Signalized	Carlisle Rd	SR 0074	0760	0000	21047	2-lane	35 MPH	N/A	No	N/A	Hilton Ave / Private Dwu	T-510 / Private Dwu	N/A	N/A	4357 3	5 MPH	N/A	N/A	14	2.80	3.40	0.579	0.34	3.00	-0.40
8	York	York Twp	4-Leg Minor-Street Stop-Controlled	George St	SR 3001	0330	0000	7985	2-lane	N/A	N/A	N/A	N/A	Grantley Rd / Joppa Rd	SR 4001/ T-508	0010 / N/A	0000 / N/A	6337	N/A	N/A	40	13	2.60	3.14	1.348	0.19	2.70	-0.44
		,	2																							1		



HSM Network Screenings



Legend

Rural Safety Network Screening Intersections

EXCESS

- >4-6.2
- > 0.8 4
- > 0 0.8
- > -1.5 0
- -6.6 -1.5

ntersections

Urban Safety Network Screening Intersection
EXCESS
○ > 4 - 20
○ > 0.8 - 4
○ > 0 - 0.8
○ > -1.5 - 0
O -7.11.5
Urban Safety Network Screening Segments
EXCESS



Rural Safety Network Screening Segments

EXCESS

• • >= 4

• • 0.81 to 4

.



Network Screening Limitations

- 1. Pennsylvania does not currently have SPF equations for various facilities such as roundabouts, ramps, ramp terminals, and freeways.
- 2. Pennsylvania does not have SPF equations for Fatal / Injury crashes.
- 3. The initial segment crash clusters are based on primary or secondary, but not both.
- 4. Intersection crashes account for all crashes within 250 feet.
 - Tight intersection spacing requires further analysis.
 - Intersection related crashes outside of 250 feet are not included.



Network Screening Findings

Observed Crashes	Observed Crashes / Year	Predicted Crashes / Year	Overdispersion	w	Expected Crashes / Year	Excess
11	2.20	0.71	1.348	0.51	1.44	0.73
12	2.40	1.33	0.187	0.80	1.54	0.21
5	1.00	0.47	1.117	0.66	0.65	0.18
6	1.20	1.00	0.982	0.50	1.10	0.10
5	1.00	0.79	1.117	0.53	0.89	0.10
6	1.20	1.06	1.348	0.41	1.14	0.08
6	1.20	0.93	0.381	0.74	1.00	0.07
6	1.20	1.13	1.117	0.44	1.17	0.04
9	1.80	1.82	1.348	0.29	1.81	-0.01
5	1.00	1.09	1.348	0.40	1.04	-0.05
5	1.00	1.16	1.348	0.39	1.06	-0.10
6	1.20	1.38	1.117	0.39	1.27	-0.11
5	1.00	1.21	1.117	0.43	1.09	-0.12
6	1.20	1.48	1.117	0.38	1.31	-0.17
5	1.00	1.28	1.348	0.37	1.10	-0.18
9	1.80	2.23	0.381	0.54	2.03	-0.20
10	2.00	2.91	0.203	0.63	2.57	-0.34
7	1.40	1.95	1.117	0.31	1.57	-0.38
12	2.40	2.97	1.117	0.23	2.53	-0.44
7	1.40	2.37	0.381	0.53	1.91	-0.46
13	2.60	3.98	0.203	0.55	3.36	-0.62
6	1.20	2.13	1.283	0.27	1.45	-0.68
22	4.40	5.70	0.203	0.46	5.00	-0.70



Network Screening Follow-Up

- Analyzed the highest excess value for each segment and intersection in each County.
- Completed a field view, detailed crash analysis, and determined potential improvement considerations.
- The top locations accounted for 19 intersection related crash trends and 11 segment related crash trends.
- Seemingly obvious issues were revealed (i.e. missing warning signage, lack of protected phasing, etc.)



Uses/Benefits of HSM Network Screenings

- Help select HSIP project sites
- Help select LCSIP projects
- Refer to these county reports when providing design project crash analysis
 - Can be used in place of CDART Homogenous list comparison to crash rate
- Provides a fair comparison of locations based on:
 - crash data
 - facility type
 - operations data
 - geometric data
- Does not favor locations with more exposure



PennDOT Highway Safety Manual Training

- 6/6/2018 Grantville, PennDOT EPTF
- 10/10/2018 Bridgeville, District 11-0
- 10/24/2018 Indiana, District 10-0
- 2/5/2019 King of Prussia, District 6-0
- 4/10/2019 Grantville, PennDOT EPTF



□ 1.5 Days Long

- □ All classes include an afternoon session dedicated to using HSM analysis tools
- □ Contact <u>RA-PDHighAdminTrain@pa.gov</u> to enroll



Benjamin Brubaker, Senior Traffic Engineer Gibson-Thomas Engineering

ben.brubaker@gibson-thomas.com

Jeff Roecker, Senior Traffic Control Specialist Pennsylvania Department of Transportation jroecker@pa.gov

